Role of Eocene-Oligocene Mass Transport Deposits for Controlling Along-Strike Variations in Thickness, Structural Geology, and Hydrocarbon Sealing, Mexican Ridges Fold-Thrust Belt, Western Gulf of Mexico

Jack Kenning and Paul Mann

Department of Earth and Atmospheric Sciences, University of Houston,
Science and Research Bldg. 1, Rm. 427, Houston, Texas 77204

GCAGS Explore & Discover Article #00350*
http://www.gcags.org/exploreanddiscover/2018/00350_kenning_and_mann.pdf
Posted September 29, 2018.

*Article based on an abstract published in the *GCAGS Transactions* (see footnote reference below) and delivered as a poster presentation at the 68th Annual GCAGS Convention and 65th Annual GCSSEPM Meeting in Shreveport, Louisiana, September 30–October 2, 2018.

ABSTRACT

The Mexican Ridges Fold-Thrust Belt (MRFTB) of the western Gulf of Mexico is a 600 km long, deepwater fold-belt along the eastern continental margin of Mexico. The MRFTB formed as the downdip, contractional domain of a Miocene to Recent gravity-driven system, detaching along Eocene-Oligocene mass transport deposits (MTDs), associated slumps and shaly units. A 20,000 km grid of 2D seismic data was used to map the highly-deformed, shale-rich MTDs underlying the fold structures and document their along-strike variability in the MRFTB. Eight significant MTD events have been mapped ranging in thickness from 100–1500 m; the largest MTD extends more than 300 km eastward into the deepwater Gulf of Mexico. Paleogene, Laramide-related uplift, and post-Laramide volcanic activity resulted in point-sourced, clastic sedimentary influx in the area of the MRFTB from paleo-river mouths along the eastern Sierra Madre Oriental. Uplift and tectonic instability along the margin resulted in slope failure and deposition of stacked MTDs with lobate geometries in map view. Paleogene deposits thickened by MTDs are less extensive in the southern MRFTB where MTDs rarely exceed 200 m thickness. The areas of the thickest MTDs are characterized by: (1) smaller, overlying fold wavelengths (2–7 km) but larger fold amplitudes (3.5–6.6 km); (2) wider, arcuate fold pattern map view mimicking the shape of the underlying MTD; and (3) along-strike changes in detachment depth from >7500 km in the MTD-thickened Paleogene section of the northern MRFTB, to 6500 km in the thinner, MTD-poor Paleogene section directly south. These along-strike variations in the MRFTB suggest that: (1) the MTDs remain fluid-rich to the present-day and promote overpressure that in turn controls the width and internal structure of the overlying thrust belt; and (2) over-pressured MTDs >150 m thickness likely form regional seals for hydrocarbons generated in the underlying Mesozoic section, although migration pathways may occur on thrusts that breach the MTDs.

Originally published as: Kenning, J., and P. Mann, 2018, Role of Eocene-Oligocene mass transport deposits for controlling along-strike variations in thickness, structural geology, and hydrocarbon sealing, Mexican Ridges Fold-Thrust Belt, Western Gulf of Mexico: Gulf Coast Association of Geological Societies Transactions, v. 68, p. 719.